

The following pages provide tables of drugs commonly used at the National Institutes of Health (NIH) for pre-anesthesia, anesthesia, analgesia, sedation, tranquilization, and restraint of laboratory animal species.

The dosage recommendations and other data presented on the following pages are based upon current data in the literature and the professional judgement of veterinarians on the NIH Animal Care and Use Committee Subcommittee on Training. Doses published in the literature are often variable.

Proper drug doses may vary greatly depending on species, strain, sex, age, physiologic status of the animal, and the level of anesthesia/analgesia desired.

Although these lists provide a ready source of information on drug doses, individuals should not use these drugs without prior experience.

Your institute or animal facility veterinarians are available for consultation and additional information.

The page facing each table provides species specific information.

Controlled drugs are identified by a "C." The Roman numeral classifies the drug into one of the five established schedules of controlled substances (e.g., sodium pentobarbital, C-II).

Abbreviations:

IV	= intravenous
IM	= intramuscular
IP	= intraperitoneal
SC	= subcutaneous
PO	= per os, oral
IH	= inhalation
qXh	= every X hours

SPECIES INFORMATION

MOUSE (*Mus musculus*)

Physiologic parameters:

Body temperature = 36.5-38.0°C
Heart rate = 325-780/min
Respiratory rate = 94-163/min
Tidal volume = 0.09-0.23 ml

The use of chloroform as an anesthetic agent is discouraged. Chloroform can cause renal tubular calcification and/or necrosis, particularly in male mice; DBA/2 strain most susceptible.

Avertin is made by mixing equal amounts of tribromyl ethyl alcohol and tertiary amyl alcohol (2.5% dilution). If Avertin is improperly prepared or stored in the light, it will break down into dibromoacetic acid and hydrobromic acid which can be lethal in 24 hours. **Freshly mixed solutions are strongly recommended for safe use.** The solution can be kept as long as 4 months if it is stored in the dark at 4 degrees C. The solution should be tested to ensure that it has a pH >5.

- * The therapeutic dose for carbon dioxide is close to the lethal dose; very short acting. Concurrent administration of 10-50% O₂ is recommended.
- ** Best for minor surgery procedures only.

MOUSE (*Mus musculus*)

<u>Drug indication and Drugs</u>	<u>Dosage and Route of Administration</u>
----------------------------------	---

Restraint/Preanesthesia

Atropine	0.02-0.05 mg/kg	IM
Diazepam, C-IV (Valium®)	5 mg/kg	IP
Ketamine, C-III (Ketaset®, Vetalar®)	22-44 mg/kg	IM
Telazol®, C-III (for restraint)	100-160 mg/kg	IM IP
Carbon dioxide* + 10-50% O ₂	To effect	IH

Anesthesia

Sodium Pentobarbital, C-II	50-90 mg/kg	IP
Ketamine**, C-III	50-200 mg/kg	IP
Avertin (Tribromoethanol)	40-60 mg/kg 125-250 mg/kg 0.02 ml/g (1.2% solution)	IM
Ketamine/Xylazine:		
- Add 7 mg xylazine to 35 mg ketamine (dose based on ketamine)	70-80 mg/kg	IM IP
- Add 1.0 ml xylazine (100 mg/ml) and 1.0 ml ketamine (100 mg/ml) and 4.6 ml sterile water.	0.1 ml/20 g	IM IP
Halothane (Fluothane®)	To effect	IH
Isoflurane	To effect	IH

Analgesia

Morphine, C-II	5-10 mg/kg q2-4h	SC IP
Butorphanol tartrate (Torbugesic®), C-IV	2.5-5 mg/kg q1-2h	SC
Buprenorphine, C-V	2 mg/kg q12h	SC IP
Oxymorphone, C-II	0.15 mg/kg q4h	IM
Ketorolac	0.7-10 mg/kg q24h	PO

SPECIES INFORMATION

RAT (*Rattus norvegicus*)

Physiologic parameters:

Body temperature = 35.9-37.5°C

Heart rate = 250-450/min

Respiratory rate = 70-115/min

Tidal volume = 0.6-2.0 ml

Male rats and animals receiving low calorie diets require higher doses of barbiturates.

Avertin has been reported to cause ileus in rats

The therapeutic dose for carbon dioxide is close to the lethal dose; very short acting. Concurrent administration of 10-50% O₂ is recommended.

The reversal agent, yohimbine, is only effective when xylazine or medetomidine has been used.

- * The projected duration of action for an analgesic is an approximation because the nature of the procedure and the level of pain that is experienced affect it.

RAT (*Rattus norvegicus*)

<u>Drug indication and Drugs</u>	<u>Dosage and Route of Administration</u>
Restraint/Preanesthesia	
Atropine	0.04-0.1 mg/kg SC
Diazepam, C-IV (Valium®)	0.5-15 mg/kg IP
Ketamine, C-III (Ketaset®, Vetalar®)	22-50 mg/kg IM
Carbon dioxide + 10-50% O ₂	To effect IH
Anesthesia	
Sodium Pentobarbital, C-II	30-60 mg/kg IV IP
Ketamine, C-III (10 mg/ml solution)	50-90 mg/kg IM
	50-100 mg/kg IP
Ketamine/Xylazine:	
ketamine	40-80 mg/kg IM IP
xylazine	10 mg/kg IM IP
Halothane (Fluothane®)	To effect IH
Isoflurane	To effect IH
Carbon dioxide	To effect IH
Telazol®, C-III	20-40 mg/kg IP
	20 mg/kg IM
Ketamine/Medetomidine	
Ketamine	60-75 mg/kg IP
Medetomidine (Domitor®)	0.25-0.5 mg/kg SC
Chloral hydrate	300-400 mg/kg IP (5% solution)
Analgesia*	
Morphine, C-II	1.5-6 mg/kg q2-4h SC
Butorphanol tartrate, C-IV (Torbugesic®)	2.5-5 mg/kg q1-2h SC
Carprofen	5 mg/kg q12h SC
Ketorolac	3-5 mg/kg q12-24h PO
	1 mg/kg q12-24h IM
Buprenorphine, C-V	0.01-0.05 mg/kg SC IP
Reversal Agents	
Yohimbine (reverses xylazine)	1-2 mg/kg IM IP

SPECIES INFORMATION

HAMSTER (*Mesocricetus auratus*)

Physiologic parameters:

Body temperature = 37-38°C

Heart rate = 250-500/min

Respiratory rate = 35-135/min

Tidal volume = 0.6-1.4 ml

Syrian or golden hamster is very resistant to morphine - no sedation or hypnotic effects.

Syrian or golden hamster has an increased tolerance to pentobarbital.

HAMSTER (*Mesocricetus auratus*)

Drug indication and Drugs

Dosage and Route of Administration

Restraint/Preanesthesia

Atropine	0.1 mg/kg	IP IM SC
Ketamine, C-III (Ketaset®, Vetalar®)	22-44 mg/kg	IM

Anesthesia

Sodium Pentobarbital, C-II	30-90 mg/kg	IP
Ketamine/Xylazine:		
Xylazine	10 mg/kg	IP IM
Ketamine	100 mg/kg	IP
Telazol®, C-III	20-80 mg/kg	IP IM
Halothane (Fluothane®)	To effect	IH
Isoflurane	To effect	IH
Ketamine/Diazepam, C-IV	0.5mg/kg	IM IP

Analgesia

Buprenorphine, C-V	0.05-0.1 mg/kg q8-12h	SC IM
Butorphanol tartrate, C-IV (Torbugesic®)	1-5 mg/kg q2-4h	SC IM

SPECIES INFORMATION

GUINEA PIG (*Cavia porcellus*)

Physiologic parameters:

Body temperature = 37.2-39.5°C

Heart rate = 230-380/min

Respiratory rate = 42-104/min

Tidal volume = 2.3-5.3 ml/kg

Large cecum can act as reservoir for anesthetics. Depending on drug solubility, the cecum can alter the pharmacologic effect.

Induction of anesthesia using volatile anesthetics (e.g., halothane and isoflurane) should be done with caution due to initial breath holding when animals are first exposed to irritating gas vapors.

Repeated exposure to halothane can cause hepatotoxicity. Isoflurane is a safer inhalant anesthetics to use.

Self mutilation has been reported in guinea pigs after ketamine administration.

GUINEA PIG (*Cavia porcellus*)

Drug indication and Drugs

Dosage and Route of Administration

Restraint/Preanesthesia

Atropine	0.05 mg/kg	SC
Diazepam, C-IV (Valium®)	2.5-5.0 mg/kg	IP IM
Acetylpromazine	5-10 mg/kg	IM SC IV
Ketamine, C-III (Ketaset®, Vetalar®)	22-30 mg/kg	IM

Anesthesia

Sodium Pentobarbital, C-II	15-40 mg/kg	IP
Sodium Thiopental, C-III	20 mg/kg	IV
Ketamine, C-III	40-50 mg/kg	IM
Ketamine/Xylazine:		
Xylazine	5-13 mg/kg	SC
Ketamine	44 mg/kg	SC
Halothane (Fluothane®)	To effect	IH
Isoflurane	To effect	IH

Analgesia

Buprenorphine, C-V	0.05 mg/kg q8-12h	SC
Morphine, C-II	10 mg/kg q2-4h	SC IM
Aspirin	86 mg/kg	PO
Butorphanol tartrate, C-IV (Torbugesic®)	0.25-0.4 mg/kg	IV SC

Reversal Agent:

Atipemazole (Antisedan®)	1 mg/kg	IM IV SC IP
--------------------------	---------	-------------

SPECIES INFORMATION

RABBIT (*Oryctolagus cuniculus*)

Physiologic parameters:

Body temperature = 38-39.6°C
Heart rate = 130-325/min
Respiratory rate = 32-60/min
Tidal volume = 4-6 ml/kg

Many rabbits have serum atropinesterase which causes reduced response to atropine.
Glycopyrrolate, another anticholinergic, can be used instead of atropine.

Unique hypnotism or immobilization reflex has been observed in rabbits in the absence of drug use.

Large cecum can act as reservoir for anesthetics. Depending on drug solubility, the cecum can alter the pharmacologic effect.

Induction of anesthesia using volatile anesthetics (e.g., halothane and isoflurane) should be done with caution due to initial breath holding when animals are first exposed to irritating gas vapors.

Give IV injections via marginal ear veins.

Self mutilation has been reported in rabbits after IM ketamine administration. Dilution of ketamine with saline will limit this side effect.

RABBIT (*Oryctolagus cuniculus*)

<u>Drug indication and Drugs</u>	<u>Dosage and Route of Administration</u>
----------------------------------	---

Restraint/Preanesthesia

Ketamine, C-III (Ketaset®, Vetalar®)	15-50 mg/kg	IM
Acetyl promazine	1.0-10 mg/kg	IM SC IV
Ketamine/Acetyl promazine (10:1)	15-50 mg/kg	IM
Diazepam, C-IV (Valium®)	5-10 mg/kg	IV IM
Glycopyrrolate	0.005-0.011 mg/kg	IM
Butorphanol & Acepromazine		
Butorphanol tartrate, C-IV (Torbugesic®)	1 mg/kg	SC
Acetyl promazine	1 mg/kg	SC

Anesthesia

Sodium Pentobarbital, C-II (3% solution given slowly to effect)	15-40 mg/kg	IV
Ketamine/Xylazine/Acepromazine:		
Xylazine	5-10 mg/kg	IM
Ketamine, C-III	35-50 mg/kg	IM
Acepromazine	0.75 mg/kg	IM
Ketamine/Midazolam		
Ketamine, C-III	25 mg/kg	IM
Midazolam, C-IV	1 mg/kg	IM
Ketamine/Diazepam		
Ketamine, C-III	15-50 mg/kg	IM
Diazepam, C-IV	5-10 mg/kg	IM
Ketamine/Acepromazine/Butorphanol		
Ketamine, C-III	35 mg/kg	SC
Acepromazine	0.75 mg/kg	SC
Butorphanol tartrate, C-IV (Torbugesic®)	0.1 mg/kg	SC
Halothane (Fluothane®)	To effect	IH
Isoflurane	To effect	IH

Analgesia

Morphine, C-II	5 mg/kg q2-4h	SC IM
Acetylsalicylic Acid (Aspirin)	500 mg/kg	PO
Buprenorphine, C-V	0.02-0.1 mg/kg q8-12h	SC
Butorphanol tartrate, C-IV (Torbugesic®)	0.1-1.5 mg/kg q4h	IV
	1.0-7.5 mg/kg q4h	IM SC
Flunixin meglumine (Banamine®)	1.1 mg/kg q12h	IM SC
Carprofen	1.5 mg/kg q12h	PO
Ketoprofen	3 mg/kg q12h	IM

Reversal Agents

Yohimbine (reverses xylazine)	0.2 mg/kg	IV
-------------------------------	-----------	----

SPECIES INFORMATION

CAT (*Felis catus*)

Physiologic parameters:

Body temperature = 38.5°C
Heart rate = 110-140/min
Respiratory rate = 26/min
Tidal volume = 20 ml

Morphine should be used with caution in cats. It causes extreme hyperexcitement if overdosed.

Nonsteroidal anti-inflammatory drugs should generally not be used in cats. Acetaminophen, ibuprofen, flunixin meglumine, and phenylbutazone are contraindicated. Aspirin is toxic to cats and must be dosed very carefully. Aspirin can cause bone marrow depression, anemia, gastric lesions, and death.

Ketamine at a dose of 44 mg/kg IM can produce mortality in some cats; 25 mg/kg IM is usually adequate for most individuals.

The dosage and frequency of administration of all analgesic agents must be tailored to the animal, procedure, and magnitude of pain present. Combinations of narcotics and non-steroidal agents are commonly used. Consult your veterinarian for specific recommendations.

- * Pre-medication with Atropine or Glycopyrrolate is suggested to avoid bradycardia and cardiac arrhythmias with these agents.
- ** Poor analgesia. Adequate for superficial procedures only!

CAT (*Felis catus*)

<u>Drug indication and Drugs</u>	<u>Dosage and Route of Administration</u>
Restraint/Preanesthesia	
Atropine	0.02-0.04 mg/kg
Glycopyrrolate	0.02 mg/kg
Ketamine, C-III (Ketaset®, Vetalar®)	11 mg/kg
Ketamine/Acetylpromazine (10:1) (dose based on ketamine)	11 mg/kg
Acetylpromazine	0.055-0.11 mg/kg 1.1-2.2 mg/kg
Xylazine (Rompun®)*	0.04-0.9 mg/kg
Diazepam, C-IV (Valium®)	1 mg/kg
Anesthesia	
Sodium Pentobarbital, C-II	20-30 mg/kg
Sodium Thiopental, C-III (2.5%)	8-12 mg/kg
Ketamine, C-III (Ketaset®, Vetalar®)	10-25 mg/kg
Ketamine/Acetylpromazine (10:1) (dose based on ketamine)	10-25 mg/kg
Ketamine/Xylazine*	
Xylazine	1 mg/kg
Ketamine, C-III redose ketamine as needed	10 mg/kg 4-8 mg/kg
Ketamine/Diazepam** (2:1)	
Ketamine, C-III	0.5-1 mg/lb
Diazepam, C-IV	0.1-0.2 mg/lb
Halothane (Fluothane®)	To effect
Isoflurane	To effect
Analgesia	
Morphine, C-II	0.5-5.0 mg/kg q2-4h
Butorphanol tartrate, C-IV (Torbugesic®)	0.055-0.11 mg/kg q6-12h
Buprenorphine, C-V	0.01-0.02 mg/kg q12 h
Flunixin meglumine (Banamine®)	0.5-2.2 mg/kg daily
Acetylsalicylic Acid (Aspirin)	25 mg/kg q8h
Morphine, C-II	0.1 mg/kg
Carprofen (Rimadyl®)	4mg/kg q24h 1-2 mg/kg q12h
Ketoprofen	1-2 mg/kg q24h
Reversal Agents	
Yohimbine (reverses xylazine)	0.1 mg/kg
Atipamezole (reverses medetomidine)	0.05 mg/kg
Nalaxone	0.005-0.02 mg/kg

SPECIES INFORMATION

DOG (*Canis familiaris*)

Physiologic parameters:

Body temperature = 39°C

Heart rate = 100-130/min

Respiratory rate = 22/min

Tidal volume = 250 ml

Ketamine should not be used alone in dogs as it may cause seizures in some individuals. Ketamine should be used in combination with a tranquilizer.

Nonsteroidal anti-inflammatory drugs should be used with caution in dogs. Acetaminophen and ibuprofen are contraindicated. Aspirin must be dosed very carefully.

The dosage and frequency of administration of all analgesic agents must be tailored to the animal, procedure, and magnitude of pain present. Combinations of narcotics and non-steroidal agents are commonly used. Consult your veterinarian for specific recommendations.

* Pre-medication with Atropine or Glycopyrrolate is suggested to avoid bradycardia and cardiac arrhythmias with these agents.

** Poor analgesia. Adequate for superficial procedures only!

DOG (*Canis familiaris*)

Drug indication and Drugs

Dosage and Route of Administration

Restraint/Preanesthesia

Atropine	0.02-0.05 mg/kg	IM SC IV
Glycopyrrolate	0.01-0.02 mg/kg	IM SC
Acetylpromazine	0.055-0.11 mg/kg	IM SC IV
	0.55-2.2 mg/kg	PO
Diazepam, C-IV (Valium®)	1-5 mg/kg	IM
	0.2-0.6 mg/kg	IV
Medetomidine	0.1-0.8 mg/kg	IM SC IV
Xylazine (Rompun®)*	1.0-2.0 mg/kg	IM SC

Anesthesia

Sodium Pentobarbital, C-II	30 mg/kg	IV
Thiopental Sodium, C-II	10-35 mg/kg	IV
Ketamine/Xylazine*:		
Ketamine, C-III	5-10 mg/kg	IM
Xylazine	1-2 mg/kg	IM
Ketamine/Diazepam (2:1)**		
Ketamine, C-III	5.5 mg/kg	IV
Diazepam, C-IV	0.33 mg/kg	IV
Ketamine/Medetomidine*		
Ketamine, C-III	2.5-7.5mg/kg	IM
Medetomidine (Domitor®)	0.04 mg/kg	IM
Ketamine/Midazolam**		
Ketamine, C-III	5-10 mg/kg	IV
Midazolam, C-IV	0.28-0.5 mg/kg	IV
Propofol**	5.0-7.5 mg/kg	IV
Halothane (Fluothane®)	To effect	IH
Isoflurane	To effect	IH
Halothane/Nitrous Oxide (50% O ₂ + 50% N ₂ O)	To effect	IH

Analgesia

Morphine, C-II	0.5-5 mg/kg q2-4h	SC IM
Acetylsalicylic Acid (Aspirin)	25 mg/kg q8h	PO
Flunixin meglumine (Banamine®)	0.5-2.2 mg/kg daily	IM IV
Butorphanol tartrate, C-IV (Torbugesic®)	0.055-0.11 mg/kg q6-12h	SC
	0.55 mg/kg q6-12h	PO
Buprenorphine, C-V	0.01-0.02 mg/kg q12h	SC IM
Carprofen (Rimadyl®)	4 mg/kg q24h	SC IV
	1-2 mg/kg q12h	PO
Ketoprofen	1-2 mg/kg q24h	SC IM IV PO

Reversal Agents

Yohimbine (reverses xylazine)	0.1 mg/kg	IV
Atipamezole (Antisedan®)	0.05 mg/kg	IM
Naloxone (reverses opioids)	0.005-0.02 mg/kg	IV

SPECIES INFORMATION

SHEEP (*Ovis aries*) and GOAT (*Capra hircus*)

Physiologic parameters:

<u>Sheep</u>	<u>Goat</u>
Body temperature = 39.5°C	Body temperature = 39°C
Heart rate = 60-120/min	Heart rate = 70-135/min
Respiratory rate = 19/min	Respiratory rate = 20/min
Tidal volume = 300 ml	Tidal volume = 325 ml

Anesthetic combination: Mix 1 ml xylazine (100 mg/ml), 1 ml butorphanol tartrate, C-IV (Torbugesic®), and 8 ml sterile water. Dose at .05 mg/kg IV and give 1 ml ketamine IM.

Sheep and goats should be fasted for 18-24 hours prior to induction of anesthesia to control regurgitation. Water should be withheld for about 6 hours.

Positioning of ruminants during anesthesia is an important consideration. Right lateral recumbency should be avoided, as this results in excessive intra-abdominal pressure, pressure on the diaphragm, and the collection of gas in the rumen.

Saliva may continue to flow in considerable quantities during general anesthesia in ruminants.

Xylazine should be used in the 20 mg/ml concentration; allows better dosage control.

* Xylazine must be used with caution because some animals become hypoxic.

SHEEP (*Ovis aries*) and GOAT (*Capra hircus*)

Drug indication and Drugs

Dosage and Route of Administration

Restraint/Preanesthesia

Ketamine, C-III (Ketaset®, Vetalar®)	5-7 mg/kg	IV
Acetylpromazine	0.05-1.0 mg/kg	IM SC IV
Diazepam, C-IV (Valium®)	0.2-0.5 mg/kg	IV IM
Glycopyrrolate	0.25 mg/10 lbs	IV SC IM

Anesthesia

Sodium Pentobarbital, C-II	30-40 mg/kg	IV
Sodium Thiopental, C-III (5%)	10-15 mg/kg	IV
Xylazine/Ketamine:		
Xylazine	0.1 mg/kg	IM
Ketamine, C-III	5 mg/kg	IM
Xylazine/Butorphanol	See under <i>Species Information</i>	
Halothane (Fluothane®)	To effect	IH
Halothane/Nitrous Oxide (50% O ₂ + 50% N ₂ O)	To effect	IH

Analgesia

Flunixin meglumine (Banamine®)	2.2 mg/kg	IV
Meperidine, C-II (Demerol®)	5 mg/kg	IV
Phenylbutazone	4-8 mg/kg q24h	PO
	2-5 mg/kg q24h	IV
Xylazine* (Rompun®)	0.05 mg/kg	IV
Butorphanol tartrate, C-IV (Torbugesic®)	0.3 mg/kg	SC IV
Buprenorphine, C-V	0.005 mg/kg q12h	SC

Reversal Agents

Yohimbine (reverses xylazine)	0.2 mg/kg (ovine)	IV
-------------------------------	-------------------	----

SPECIES INFORMATION

SWINE (*Sus scrofa*)

Physiologic parameters:

Body temperature = varies by breed: 37-39°C

Heart rate = varies by breed: 58-105/min

Respiratory rate = varies by breed: 10-25/min

Tidal volume = varies by breed

Larger swine require a lower dose of many drugs in the given ranges due to higher percent body fat.

SWINE (*Sus scrofa*)

<u>Drug indication and Drugs</u>	<u>Dosage and Route of Administration</u>
Restraint/Preanesthesia	
Atropine	0.05 mg/kg
Sodium Pentobarbital, C-II	8-11 mg/kg
Acetylpromazine	1.1-2.2 mg/kg
Xylazine (Rompun®)	2 mg/kg
Diazepam, C-IV (Valium®)	0.5-10 mg/kg 0.44-2 mg/kg
Midazolam, C-IV	0.1-0.5 mg/kg
Glycopyrrolate	0.004-0.01 mg/kg
Anesthesia	
Telazol®, C-III	2.0-8.8 mg/kg
Sodium Pentobarbital, C-II	20-40 mg/kg
Sodium Thiopental, C-III (5%)	6.6-30 mg/kg
Ketamine, C-III (Ketaset®, Vetalar®)	11-33 mg/kg
Xylazine/Ketamine:	
Xylazine	2 mg/kg
Ketamine, C-III	20 mg/kg
Acetylpromazine/Ketamine:	
Acetylpromazine	1.1 mg/kg
Ketamine, C-III	33 mg/kg
Ketamine/Diazepam:	
Ketamine, C-III	15 mg/kg
Diazepam, C-IV	2 mg/kg
Ketamine/ Medetomidine:	
Ketamine, C-III	10 mg/kg
Medetomidine (Domitor®)	0.2 mg/kg
Isoflurane	To effect
Analgesia	
Acetylsalicylic Acid (Aspirin)	10-20 mg/kg q8h
Meperidine, C-II (Demerol®)	4 mg/kg
Buprenorphine, C-V	0.05-0.1 mg/kg q8-12h
Butorphanol tartrate, C-IV (Torbugesic®)	0.1-0.3 mg/kg q4-6h
Carprofen (Rimadyl®)	0.5-4.0 mg/kg daily
Ketoprofen	1.0-3.0 mg/kg daily
Reversal Agents	
Yohimbine (reverses xylazine)	0.05 mg/kg
Atipamezole (reverses medetomidine)	1 mg/kg
Naloxone (reverses opioids)	0.05-0.2 mg/kg

SPECIES INFORMATION

NONHUMAN PRIMATES

Physiologic parameters:

Rhesus

Body temperature = 37-39°C
Heart rate = 120-180/min
Respiratory rate = 32-50/min
Tidal volume = 21 ml

Baboon

Body temperature = 39°C
Heart rate = 150/min
Respiratory rate = 35/min
Tidal volume = 50 ml

The dosage and frequency of administration of all analgesic agents must be tailored to the animal, procedure, and magnitude of pain present. Combinations of narcotics and non-steroidal agents are commonly used. Consult your veterinarian for specific recommendations.

- * Pre-medication with Atropine or Glycopyrrolate is suggested to avoid bradycardia and cardiac arrhythmias with these agents.
- ** Poor analgesia. Adequate for superficial procedures only!

NONHUMAN PRIMATES

<u>Drug indication and Drugs</u>	<u>Dosage and Route of Administration</u>
----------------------------------	---

Restraint/Preanesthesia

Atropine	0.02-0.05 mg/kg	IM SC
Glycopyrrolate	0.005-0.01mg/kg	IM SC
Diazepam, C-IV (Valium®)	0.5-1.0 mg/kg	IM
Xylazine	0.5-2.0 mg/kg	IM

Anesthesia

Sodium Pentobarbital, C-II	20-30 mg/kg	IV
Sodium Thiopental, C-III (2.5%)	15-20 mg/kg	IV
Ketamine/Xylazine*:		
Ketamine, C-III	7-10 mg/kg	IM
Xylazine (Rompun®)	0.25-2.0 mg/kg	IM
Ketamine/Diazepam**:		
Ketamine, C-III	15 mg/kg	IV
Diazepam, C-IV (Valium®)	1 mg/kg	IV
Ketamine/Midazolam**:		
Ketamine, C-III	15 mg/kg	IV
Midazolam, C-IV	0.5-0.15 mg/kg	IV
Telazol®, C-III	4.0-6.0 mg/kg	IM
Halothane (Fluothane®)	To effect	IH
Isoflurane	To effect	IH

Analgesia

Morphine, C-II	1-2 mg/kg q4h	IM SC
Oxymorphone, C-II	0.15 mg/kg q4-6h	IM
Buprenorphine, C-V	0.01-0.03 mg/kg q8-12h	IM SC
Acetylsalicylic Acid (Aspirin)	10-20 mg/kg q6h	PO
Acetaminophen	10 mg/kg q8h	PO
Flunixin meglumine (Banamine®)	0.5 mg/kg daily	IM
Butorphanol tartrate, C-IV (Torbugesic®)	0.025 mg/kg q3-6h	IM
Naproxen	10 mg/kg q12h	PO
Ketorolac	15-30 mg/kg	IM

Reversal Agents

Yohimbine (reverses xylazine)	0.05 mg/kg	IV
Naloxone (reverses opioids)	0.1-0.2 mg/kg as needed	IV

AMPHIBIANS

Anesthesia

Amphibians must be kept moist over their entire bodies during anesthesia and recovery. Care must be taken that they do not become immersed, as this will result in drowning.

Tricaine (MS 222) -ethyl m-amino benzoate methanesulfonate (tricaine methane sulfonate)
Should be buffered to neutral pH before use. MS222 must be disposed as chemical waste.

Immerse in water with agent added:

1:2000 to 1:1000 for adults (i.e., 5-10mg of tricaine in 1000 ml water)

1:3000 to 1:5000 for larvae

Induction in 5-20 minutes; maintain by moist cloth contact with MS 222 solution.

Recovery - keep at 22-26°C; takes 3-6 hours; keep moist.

Benzocaine 100 mg/1000 ml water

Halothane/Isoflurane - 5% in anesthetic chamber; maintain at 3%.

Sodium Pentobarbital- 60 mg/kg; inject into dorsal lymph sac.

Analgesia

Chlorpromazine 32 mg/kg; inject into dorsal lymph sac

Chlordiazepoxide 90 mg/kg; inject into dorsal lymph sac

Buprenorphine, C-V 14 mg/kg; inject into dorsal lymph sac

Diphenhydramine 51 mg/kg; inject into dorsal lymph sac

FISH

Because fish breathe through gills rather than lungs, anesthesia must be delivered through an aquatic medium. Most fish induced by adding the anesthetic agent to the tank water. It is important to have two separate tanks; one for anesthesia and one for recovery. Water for anesthesia should be well-aerated to provide adequate oxygen and minimize the stress of induction. Food should be withheld for several hours prior to induction.

Tricaine (MS 222) -ethyl m-amino benzoate methanesulfonate (tricaine methane sulfonate)
Should be buffered to neutral pH before use. MS222 must be disposed as chemical waste.

Immerse in water with agent added; doses vary according to species:
1:20,000 (50 mg/liter) for tranquilization
1:10,000 (100 mg/liter) for surgical anesthesia

Induction occurs within 3 minutes, recovery takes 10-15 minutes after removal.

Benzocaine 20-30 mg/1000 ml water for tranquilization
 50 mg/1000 ml water for surgical anesthesia

Etomidate is an analog of propoxate and provides sedation only. It should not be used for procedures requiring surgical anesthesia.

0.05 -0.5 mg/1000 ml for tranquilization during transportation
2-4 mg/1000 ml for sedation